Octal Serial Communication Interface (OSCI)

The OSCI module is a PC/104-*Plus* Card that provides 8 free selectable serial interfaces, either RS232 or RS485 / RS422 - interface , to any PC/104-*Plus* system.
There are 2 standard variants of the OSCI module available:

OSCI-8MIX: Standard PC/104-*Plus* card for all PC/104-*Plus* compatible PCs. 8 free selectable RS232 or RS485 full or half duplex interfaces. Two self configurable interface cables are included to connecting the on board headers to standard D-SUB 9 pin connectors.

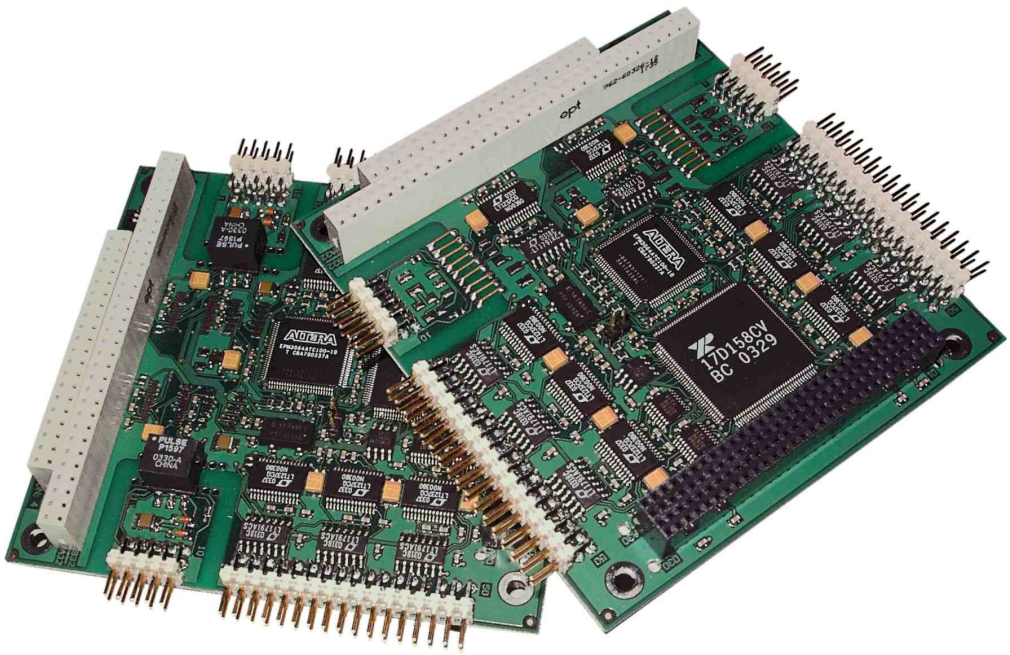
OSCI-6MIX2G: Standard PC/104-*Plus* card for all PC/104-*Plus* compatible PCs. 6 free selectable RS232 or RS485 full or half duplex interfaces. Galvanic isolation (500Vrms) on the first 2 serial interfaces (interfaces used as RS485 / RS422). Two self configurable interface cables are included to connecting the on board headers to standard D-SUB 9 pin connectors.

At the publication date of this manual, the following MPL products are supported:

- PIP405, PIP5, PIP6, PIP7, PIP8
- MIP405

Features

- PC/104-*Plus* universal board, PC/104-*Plus* Compliant
- Up to 8 serial RS232 or RS485 / RS422 interfaces
- Mixed port configuration easy selectable over software
- Standard Baud rate up to 250 kBaud
- RS485 interfaces up to 60 V fail save (optional)
- RS485 interfaces up to 6.25 Mbaud (optional)
- Galvanic Isolation on two RS485 lines (optional)
- +/- 15 kV ESD protection
- Only 5 V power supply needed
- For bigger order quantities several assembly options are available. Please feel free to contact MPL AG for further information.



© 2004 by MPL AG, Switzerland

TABLE OF CONTENTS

1. INTRODUCTION 4
1.1 ABOUT THIS MANUAL 4
1.2 SAFETY PRECAUTIONS AND HANDLING 4
1.3 ELECTROSTATIC DISCHARGE (ESD) PROTECTION 4
1.4 EQUIPMENT SAFETY 4
1.5 RELATED DOCUMENTATION 5
1.6 ORDERING INFORMATION 5
1.7 REVISION HISTORY 5

2. SPECIFICATIONS 6
2.1 PC104 / PC/104-PLUS INTERFACE 6
2.2 SERIAL INTERFACES 6
2.3 ENVIRONMENT 6

3. PARTS LOCATION 7
3.1 OSCI-8MIX 7
3.2 OSCI-6MIX2G 8
3.3 OSCI-4MIX 9

4. CONNECTORS 10
4.1 J12 / J14 PC104 CONNECTORS 10
4.2 J13 PC/104-PLUS CONNECTOR 11
4.3 SERIAL INTERFACE CONNECTORS 12
4.4 OSCI INTERFACE CABLES 14
4.4.1 CONFIGURATION OF THE CABLES 14
4.4.2 SERIAL INTERFACE D-SUB CONNECTORS 14

5. CONFIGURATION 15
5.1 PC/104-PLUS MODULE SLOT SELECTION 15
5.2 RS485 / RS232 INTERFACE SELECTION 15
5.2.1 LINUX 15
5.2.2 VxWORKS 15
5.2.3 WINDOWS 15
5.3 CABLE CONFIGURATION IN RS485 / RS422 MODE 15
5.3.1 HALF AND FULL DUPLEX 15
5.3.2 TERMINATION 15

6. OPERATION 16
6.1 RS232 BASICS 16
6.2 RS422 / RS485 BASICS 16
6.2.1 TOPOLOGIES ACCORDING TO RS422 AND RS485 16
6.2.2 SOME IMPORTANT VALUES 16

7. DRIVERS 17
7.1 LINUX 17
7.1.1 DRIVER INSTALLATION 17
7.1.2 DRIVER CONFIGURATION 17
7.1.3 DRIVER IOCTRLS 17

© 2004 by MPL AG, Switzerland

7.2 VXWORKS 17
7.3 WINDOWS 17
7.3.1 DRIVER INSTALLATION 17
7.3.1.1 WINDOWS NT 17
7.3.1.2 WINDOWS 2000 18
7.3.1.3 WINDOWS XP 22
7.3.2 DRIVER CONFIGURATION 26
7.3.3 DRIVER IOCTRLS 27
7.3.3.1 IOCTRL DEFINITION 27
7.3.3.2 IOCTRL EXAMPLE 28
7.4 TESTED OPERATING-SYSTEMS 28

8. MOUNTING 29
8.1 PARTS NEEDED FOR MOUNTING 29
8.2 MOUNTING DESCRIPTION 29
8.3 MECHANICAL DIMENSIONS 29

9. COPYRIGHT 32

10. DISCLAIMER 32

11. SUPPORT 32

© 2004 by MPL AG, Switzerland

1. INTRODUCTION

1.1 ABOUT THIS MANUAL

This manual provides all the information necessary to handle and configure the OSCI Module.
The manual is written for technical personnel responsible for integrating and using the OSCI into their systems.

1.2 SAFETY PRECAUTIONS AND HANDLING

For personal safety and safe operation of the OSCI module, follow all safety procedures described here and in other sections of the manual.

- Remove power from the system before installing (or removing) the OSCI to prevent the possibility of personal injury (electrical shock) and / or damage to the hardware.
- Handle the product carefully; i.e. dropping or mishandling the OSCI can cause damage to assemblies and components.
- Do not expose the OSCI to moisture.
- Read and follow all the instructions and warnings described herein.
- Keep the OSCI module away from all sources of liquids, such as coffee cups, drinking glasses, washing facilities etc.
- Keep this manual available for reference.

For your protection and that of the OSCI module disconnect the power input of the used host system immediately if any of the following conditions exists:

- The power input cable has been damaged.
- Something has been spilt onto the modules.
- The OSCI module has been damaged in any way, e.g. through dropping.
- You suspect that any module requires servicing or repair.

NOTE:

There are no user-serviceable components on the OSCI.

1.3 ELECTROSTATIC DISCHARGE (ESD) PROTECTION

Various electrical components within the product are sensitive to static and electrostatic discharge (ESD). Even a non-sensible static discharge can be sufficient to destroy or degrade a component's operation!
Therefor handle the module only in an ESD protected environment.
The serial interfaces are all protected against electrostatic discharge but only when the OSCI module is proper installed into a system and the system has a good Ground connection.

1.4 EQUIPMENT SAFETY

Great care is taken by MPL that all its products are thoroughly and rigorously tested before leaving the factory to ensure that they are fully operational and conform to specification. However, no matter how reliable a product, there is always the remote possibility that a defect may occur. The occurrence of a defect on this device may, under certain conditions, cause a defect to occur in adjoining and/or connected equipment. It is your responsibility to protect such equipment when installing this device. MPL accepts no responsibility whatsoever for such defects, however caused.

© 2004 by MPL AG, Switzerland

1.5 RELATED DOCUMENTATION

The following documents are related to this manual.

Reference	Description	Available from
[1]	XR17D158 Datasheet Rev. 1.1.0	Exar Corporation: www.exar.com
[2]	PC/104-*PLUS* Spec. Rev. 2.0	PC/104 Embedded Consortium: www.pc104.org
[3]	PCI Local Bus Specification Rev. 2.2.	PCI-SIG: www.pcisig.com

1.6 ORDERING INFORMATION

Product Name	Interface Options			
	Selectable RS232 or RS485/422	Fix RS232	Fix RS485/422	Galvanic isolated RS485/422
OSCI-8MIX*	8			
OSCI-8RS2		8		
OSCI-8RS4			8	
OSCI-6MIX-2G	6			2
OSCI-6RS2-2G		6		2
OSCI-6RS4-2G			6	2
OSCI-4MIX*	4			
OSCI-4RS2		4		
OSCI-4RS4			4	
OSCI-3MIX-1G	3			1
OSCI-3RS2-1G		3		1
OSCI-3RS4-1G			3	1

* Available from stock

1.7 REVISION HISTORY

This manual reflects the revision A of the OSCI module.
Publication Date : 02. June 2004

Manual Revision	Date	Description
A	02.06.2004	Initial Write

© 2004 by MPL AG, Switzerland

2. SPECIFICATIONS

2.1 PC104 / PC/104-PLUS INTERFACE

- 33MHz, 32Bit
- Accepts 3.3V and 5V PCI IO voltage
- Needs only 5V power supply from PC/104-*Plus* bus
- Power requirement (OSCI with 8 serial interfaces):
  - OSCI-8MIX: 5 V: 65 mA (Interfaces disabled)
    110 mA (all RS485 interfaces enabled)
    130 mA (all RS232 interfaces enabled)
  - OSCI-6MIX2G: 5 V: 110 mA (Interfaces disabled)
    140 mA (all RS485 interfaces enabled)
    140 mA (all RS232 interfaces enabled)
- Supports parallel PCI Interrupts

2.2 SERIAL INTERFACES

- Up to 8 Ports
- Software selectable RS232 or RS485 / RS422 full or half duplex interface
- +/-15 kV ESD protection
- 250kBaud standard baud rate for RS232 and RS485 / RS422
- Galvanic isolation on two RS485 interfaces (port 0 and 1) until 500 Vrms (optional)
- RS485 / RS422 until 60 V fail save available (optional)
- RS485 / RS422 until 6.25 MBaud available (optional)

2.3 ENVIRONMENT

- Temperature range 0 °C..70 °C
- Industrial temperature range -40 °C .. +85 °C available
- Relative humidity 5 % .. 95 %, not condensing

© 2004 by MPL AG, Switzerland

3. PARTS LOCATION

3.1 OSCI-8MIX

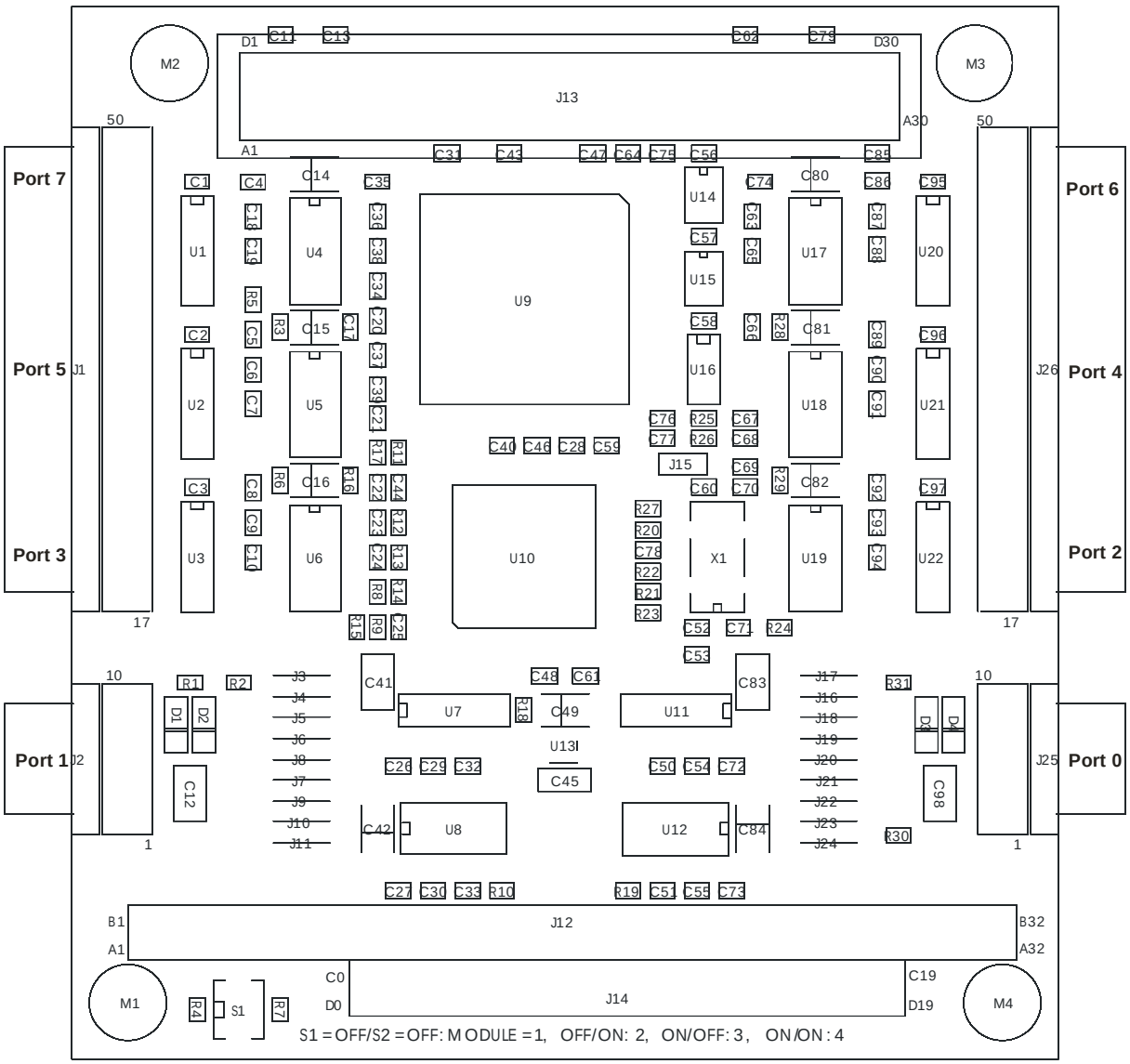


Figure 1: OSCI-8MIX, With 8 Type Selectable Interfaces

J12 / J14	PC104 Connector	J25 / J26	Serial Interface Connector 0
J13	PC/104-*Plus* Connector	J2 / J1	Serial Interface Connector 1
S1	Select-Switch For PC/104-*Plus* Module Socket		

© 2004 by MPL AG, Switzerland

3.2 OSCI-6MIX2G

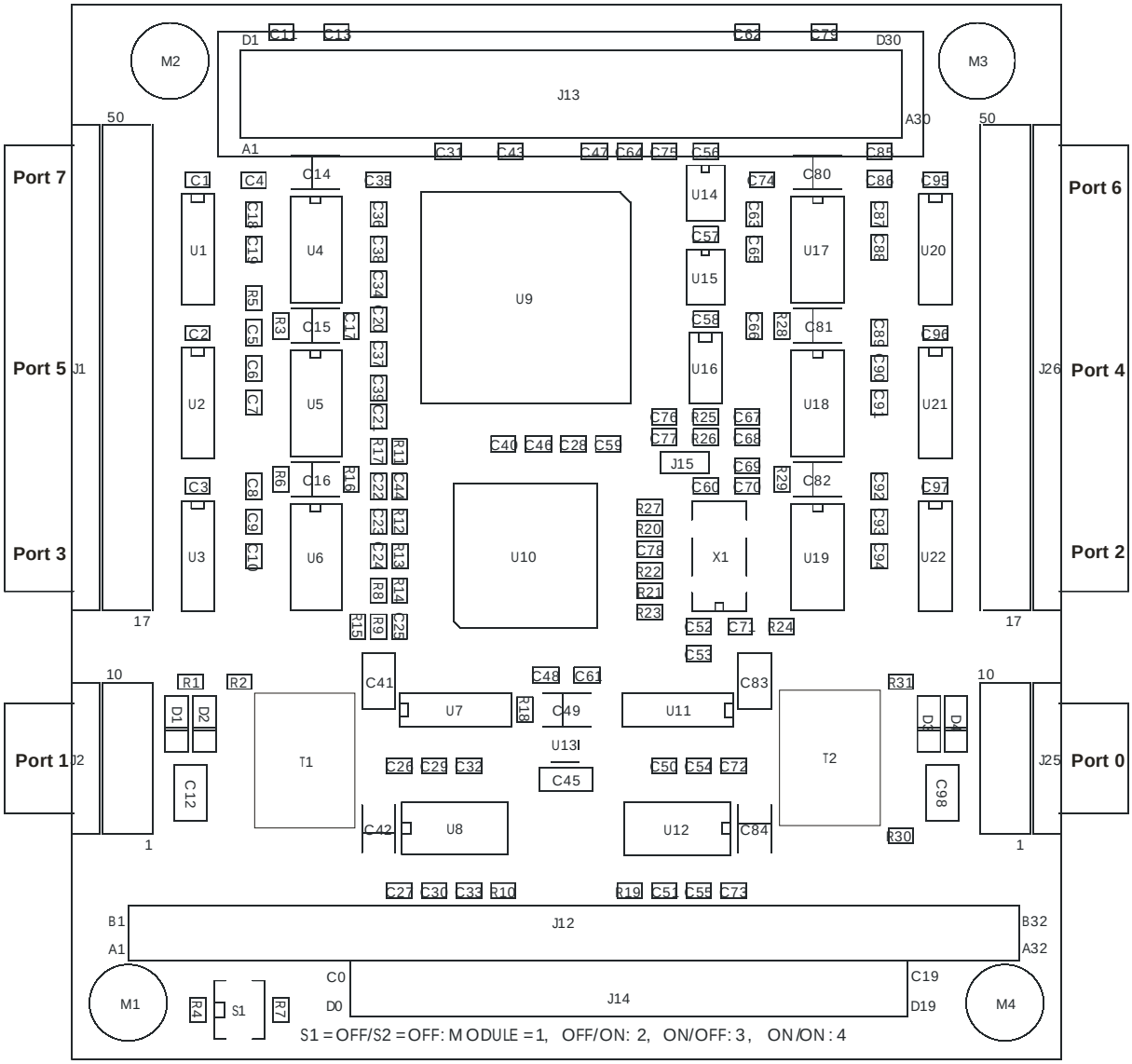


Figure 2: OSCI-6MIX2G, With 6 Type Selectable Interfaces And 2 Galvanic Isolated RS422 / RS485 Interfaces (Port 0 And Port 1)

J12 / J14	PC104 Connector	J25 / J26	Serial Interface Connector 0
J13	PC/104-*Plus* Connector	J2 / J1	Serial Interface Connector 1
S1	Select-Switch For PC/104-*Plus* Module Socket	J25 / J2	500Vrms Galvanic Isolation

© 2004 by MPL AG, Switzerland

3.3 OSCI-4MIX

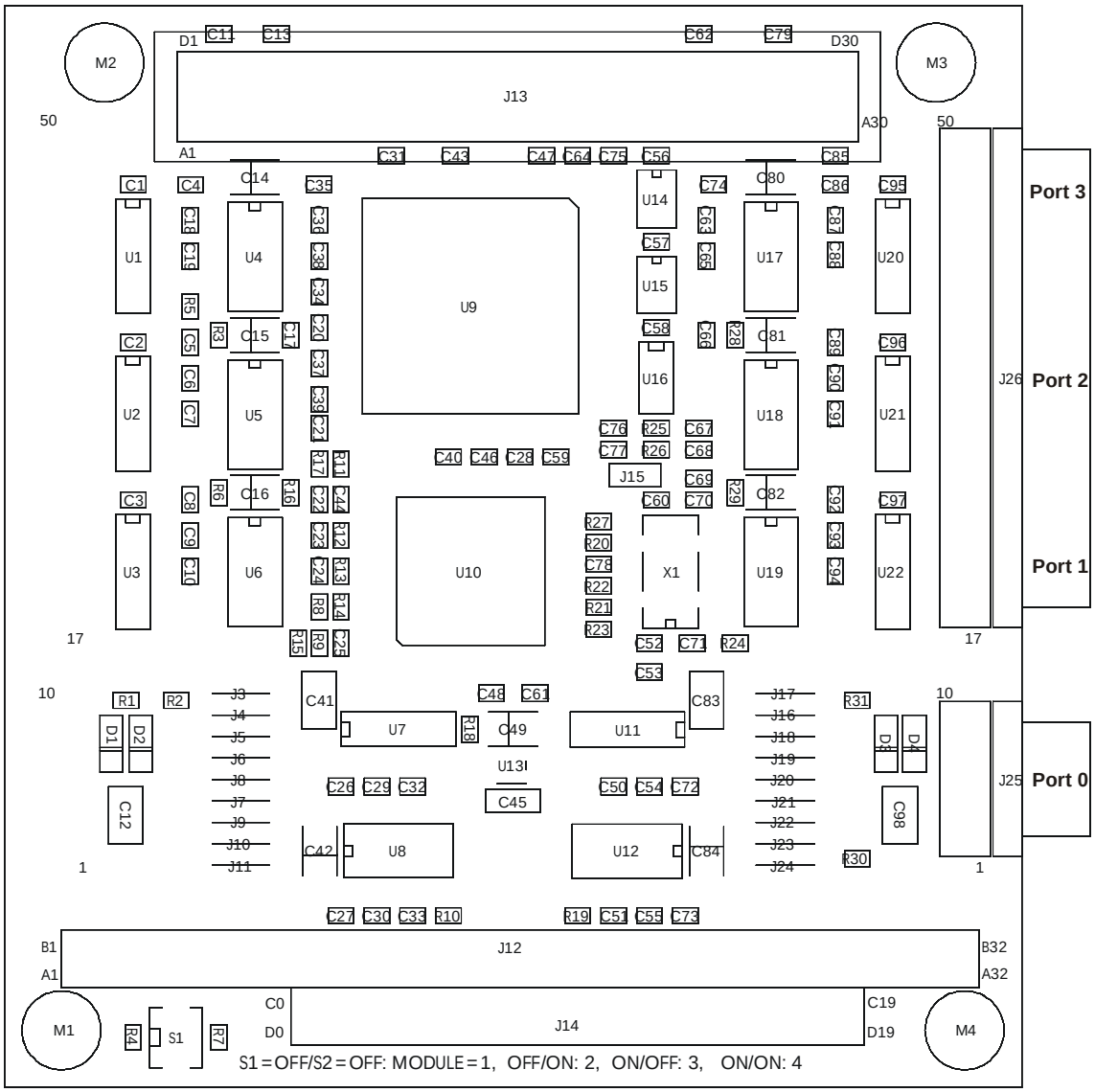


Figure 3: OSCI-4MIX, With 4 Type Selectable Interfaces

J12 / J14 PC104 Connector
J13 PC/104-*Plus* Connector
S1 Select-Switch For PC/104-*Plus* Module Socket
J25 / J26 Serial Interface Connector 0

© 2004 by MPL AG, Switzerland

4. CONNECTORS

4.1 J12 / J14 PC104 CONNECTORS

The PC104 connector is a standard 2.54mm stack through connector. Only the power pins are used on this connector. All other pins are only for stacking trough the PC104 signals.

Number	Row A	Row B	Row C	Row D	Pin Out
0	--	--	GND	GND	
1	NC (/IOCHCK)	GND	NC (/SBHE)	NC	
2	NC (SD7)	NC (RSTDRV)	NC (LA23)	NC (/IOCS16)	
3	NC (SD6)	+5V	NC (LA22)	NC (IRQ10)	
4	NC (SD5)	NC (IRQ9)	NC (LA21)	NC (IRQ11)	
5	NC (SD4)	NC (-5V)	NC (LA20)	NC (IRQ12)	
6	NC (SD3)	NC (DRQ2)	NC (LA19)	NC (IRQ15)	
7	NC (SD2)	NC (-12V)	NC (LA18)	NC (IRQ14)	
8	NC (SD1)	NC (/ENDXFR)	NC (LA17)	NC (/DACK0)	
9	NC (SD0)	NC (+12V)	NC (/MEMR)	NC (DRQ0)	
10	NC (IOCHRDY)	NC	NC (/MEMW)	NC (/DACK5)	
11	NC (AEN)	NC (/SMEMW)	NC (SD8)	NC (DRQ5)	
12	NC (SA19)	NC (/SMEMR)	NC (SD9)	NC (/DACK6)	
13	NC (SA18)	NC (/IOW)	NC (SD10)	NC (DRQ6)	
14	NC (SA17)	NC (/IOR)	NC (SD11)	NC (/DACK7)	
15	NC (SA16)	NC (/DACK3)	NC (SD12)	NC (DRQ7)	
16	NC (SA15)	NC (DRQ3)	NC (SD13)	+5V	
17	NC (SA14)	NC (/DACK1)	NC (SD14)	NC (/MASTER)	
18	NC (SA13)	NC (DRQ1)	NC (SD15)	GND	
19	NC (SA12)	NC (/REFRESH)	NC	GND	
20	NC (SA11)	NC (SYSCLK)	--	--	
21	NC (SA10)	NC (IRQ7)	--	--	
22	NC (SA9)	NC (IRQ6)	--	--	
23	NC (SA8)	NC (IRQ5)	--	--	
24	NC (SA7)	NC (IRQ4)	--	--	
25	NC (SA6)	NC (IRQ3)	--	--	
26	NC (SA5)	NC (/DACK2)	--	--	
27	NC (SA4)	NC (TC)	--	--	
28	NC (SA3)	NC (BALE)	--	--	
29	NC (SA2)	+5V	--	--	
30	NC (SA1)	NC (OSC)	--	--	
31	NC (SA0)	GND	--	--	
32	GND	GND	--	--	

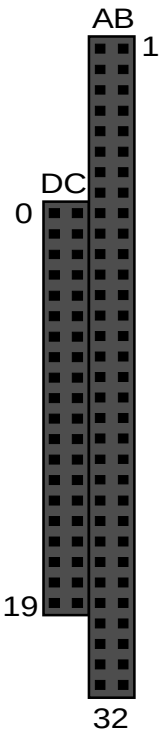


Figure 4: PC104 connector

Table 1: PC104 Connector Pin Out

Note:

- Only the shaded pins are connected, all other pins are not connected on the OSCI PCB.

© 2004 by MPL AG, Switzerland

4.2 J13 PC/104-PLUS CONNECTOR

The PC/104-*Plus* connector is a standard 2mm stack through connector.

Number	Row A	Row B	Row C	Row D	Pin Out
1	GND (5V Key)	NC	+5V	AD0	
2	+5V	AD2	AD1	+5V	
3	AD5	GND	AD4	AD3	
4	C/BE0	AD7	GND	AD6	
5	GND	AD9	AD8	GND	
6	AD11	+5V	AD10	GND (M66EN)	
7	AD14	AD13	GND	AD12	
8	NC (+3,3V)	C/BE1	AD15	NC (+3,3V)	
9	SERR	GND	NC (SBO)	PAR	
10	GND	PERR	NC (+3,3V)	NC (SDONE)	
11	STOP	NC (+3,3V)	NC (LOCK)	GND	
12	NC (+3,3V)	TRDY	GND	DEVSEL	
13	FRAME	GND	IRDY	NC (+3,3V)	
14	GND	AD16	NC (+3,3V)	C/BE2	
15	AD18	NC (+3,3V)	AD17	GND	
16	AD21	AD20	GND	AD19	
17	NC (+3,3V)	AD23	AD22	NC (+3,3V)	
18	IDSEL0	GND	IDSEL1	GND	
19	AD24	C/BE3	+5V	IDSEL2	
20	GND	AD26	AD25	IDSEL3	
21	AD29	+5V	AD28	AD27	
22	+5V	AD30	GND	AD31	
23	NC (REQ0)	GND	NC (REQ1)	+5V	
24	GND	NC (REQ2)	+5V	NC (GNT0)	
25	NC (GNT1)	+5V	NC (GNT2)	GND	
26	+5V	CLK0	GND	CLK1	
27	CLK2	+5V	CLK3	GND	
28	GND	INTD	+5V	RST	
29	NC (+12V)	INTA	INTB	INTC	
30	NC (-12V)	NC	NC	GND (3.3V Key)	

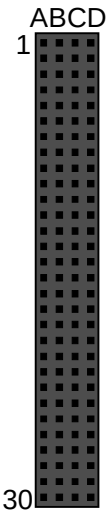


Figure 5: PC/104-*Plus* connector

Table 2: PC/104-*Plus* Connector Pin Out

Note:

- All the shaded signals are **not** connected on the OSCI PCB.

© 2004 by MPL AG, Switzerland

4.3 SERIAL INTERFACE CONNECTORS

The two serial interface connectors (standard 2.54mm headers) distribute the serial interface signals to the interface cables that support the standard 9 pin D-SUB connectors for serial interfaces.

Pin #	RS232 Signal	RS232 Signal Description	RS485 Signal	RS485/422 Signal Description	Pin Out
1	DCD0	Data Carrier Detect Port 0	NC	Not Connected	
2	DSR0	Data Set Ready Port 0	NC	Not Connected	
3	RxD0	Receive Data Port 0	Rx+0	Receive Data +	
4	RTS0	Request To Send Port 0	Rx-0	Receive Data -	
5	TxD0	Transmit Data Port 0	Tx+0	Transmit Data +	
6	CTS0	Clear To Send Port 0	Tx-0	Transmit Data -	
7	DTR0	Data Terminal Ready Port 0	NC	Not Connected	
8	RI0	Ring Indicator Port 0	NC	Not Connected	
9	GND	Ground	GND	Ground	
10	GND	Ground	GND	Ground	
11	NC	No contact available	NC	No contact available	
12	NC	No contact available	NC	No contact available	
13	NC	No contact available	NC	No contact available	
14	NC	No contact available	NC	No contact available	
15	NC	No contact available	NC	No contact available	
16	NC	No contact available	NC	No contact available	
17	DCD2	Data Carrier Detect Port 2	NC	Not Connected	
18	DSR2	Data Set Ready Port 2	NC	Not Connected	
19	RxD2	Receive Data Port 2	Rx+2	Receive Data +	
20	RTS2	Request To Send Port 2	Rx-2	Receive Data -	
21	TxD2	Transmit Data Port 2	Tx+2	Transmit Data +	
22	CTS2	Clear To Send Port 2	Tx-2	Transmit Data -	
23	DTR2	Data Terminal Ready Port 2	NC	Not Connected	
24	RI2	Ring Indicator Port 2	NC	Not Connected	
25	GND	Ground	GND	Ground	
26	GND	Ground	GND	Ground	
27	GND	Ground	GND	Ground	
28	GND	Ground	GND	Ground	
29	DCD4	Data Carrier Detect Port 4	NC	Not Connected	
30	DSR4	Data Set Ready Port 4	NC	Not Connected	
31	RxD4	Receive Data Port 4	Rx+4	Receive Data +	
32	RTS4	Request To Send Port 4	Rx-4	Receive Data -	
33	TxD4	Transmit Data Port 4	Tx+4	Transmit Data +	
34	CTS4	Clear To Send Port 4	Tx-4	Transmit Data -	
35	DTR4	Data Terminal Ready Port 4	NC	Not Connected	
36	RI4	Ring Indicator Port 4	NC	Not Connected	
37	GND	Ground	GND	Ground	
38	GND	Ground	GND	Ground	
39	GND	Ground	GND	Ground	
40	GND	Ground	GND	Ground	
41	DCD6	Data Carrier Detect Port 6	NC	Not Connected	
42	DSR6	Data Set Ready Port 6	NC	Not Connected	
43	RxD6	Receive Data Port 6	Rx+6	Receive Data +	
44	RTS6	Request To Send Port 6	Rx-6	Receive Data -	
45	TxD6	Transmit Data Port 6	Tx+6	Transmit Data +	
46	CTS6	Clear To Send Port 6	Tx-6	Transmit Data -	
47	DTR6	Data Terminal Ready Port 6	NC	Not Connected	
48	RI6	Ring Indicator Port 6	NC	Not Connected	
49	GND	Ground	GND	Ground	
50	GND	Ground	GND	Ground	

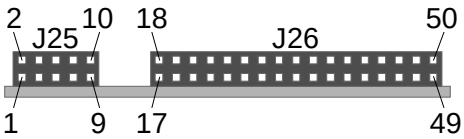


Figure 6: Serial Interface Connector 0

Table 3: Serial Interface Connector 0 Pin Out

Note:
- All interface signals are ESD protected.
- In case of galvanic isolation the galvanic isolated interface is on the pins 1..10.

© 2004 by MPL AG, Switzerland

The contacts are so arranged that the same interface cable can be used on both sides.

Pin #	RS232 Signal	RS485 Signal Description	RS485 Signal	RS485/422 Signal Description	Pin Out
1	DCD1	Data Carrier Detect Port 1	NC	Not Connected	
2	DSR1	Data Set Ready Port 1	NC	Not Connected	
3	RxD1	Receive Data Port 1	Rx+1	Receive Data +	
4	RTS1	Request To Send Port 1	Rx-1	Receive Data -	
5	TxD1	Transmit Data Port 1	Tx+1	Transmit Data +	
6	CTS1	Clear To Send Port 1	Tx-1	Transmit Data -	
7	DTR1	Data Terminal Ready Port 1	NC	Not Connected	
8	RI1	Ring Indicator Port 1	NC	Not Connected	
9	GND	Ground	GND	Ground	
10	GND	Ground	GND	Ground	
11	NC	No contact available	NC	No contact available	
12	NC	No contact available	NC	No contact available	
13	NC	No contact available	NC	No contact available	
14	NC	No contact available	NC	No contact available	
15	NC	No contact available	NC	No contact available	
16	NC	No contact available	NC	No contact available	
17	DCD3	Data Carrier Detect Port 3	NC	Not Connected	
18	DSR3	Data Set Ready Port 3	NC	Not Connected	
19	RxD3	Receive Data Port 3	Rx+3	Receive Data +	
20	RTS3	Request To Send Port 3	Rx-3	Receive Data -	
21	TxD3	Transmit Data Port 3	Tx+3	Transmit Data +	
22	CTS3	Clear To Send Port 3	Tx-3	Transmit Data -	
23	DTR3	Data Terminal Ready Port 3	NC	Not Connected	
24	RI3	Ring Indicator Port 3	NC	Not Connected	
25	GND	Ground	GND	Ground	
26	GND	Ground	GND	Ground	
27	GND	Ground	GND	Ground	
28	GND	Ground	GND	Ground	
29	DCD5	Data Carrier Detect Port 5	NC	Not Connected	
30	DSR5	Data Set Ready Port 5	NC	Not Connected	
31	RxD5	Receive Data Port 5	Rx+5	Receive Data +	
32	RTS5	Request To Send Port 5	Rx-5	Receive Data -	
33	TxD5	Transmit Data Port 5	Tx+5	Transmit Data +	
34	CTS5	Clear To Send Port 5	Tx-5	Transmit Data -	
35	DTR5	Data Terminal Ready Port 5	NC	Not Connected	
36	RI5	Ring Indicator Port 5	NC	Not Connected	
37	GND	Ground	GND	Ground	
38	GND	Ground	GND	Ground	
39	GND	Ground	GND	Ground	
40	GND	Ground	GND	Ground	
41	DCD7	Data Carrier Detect Port 7	NC	Not Connected	
42	DSR7	Data Set Ready Port 7	NC	Not Connected	
43	RxD7	Receive Data Port 7	Rx+7	Receive Data +	
44	RTS7	Request To Send Port 7	Rx-7	Receive Data -	
45	TxD7	Transmit Data Port 7	Tx+7	Transmit Data +	
46	CTS7	Clear To Send Port 7	Tx-7	Transmit Data -	
47	DTR7	Data Terminal Ready Port 7	NC	Not Connected	
48	RI7	Ring Indicator Port 7	NC	Not Connected	
49	GND	Ground	GND	Ground	
50	GND	Ground	GND	Ground	

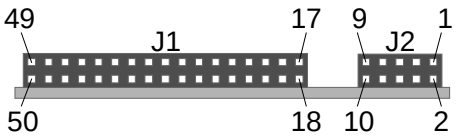


Figure 7: Serial Interface Connector 1

Table 4: Serial Interface Connector 1 Pin Out

Note:

- All interface signals are ESD protected.
- In case of galvanic isolation the galvanic isolated interface is on the pins 1..10.
- In case of OSCI-4xxx or –3xxx the Serial Interface Connector 1 is not used. All the interface signals are on connector 0 (please refer to chapter 3.3).

© 2004 by MPL AG, Switzerland

4.4 OSCI INTERFACE CABLES

The PC/104-*Plus* Card has not enough physical space to support the serial interfaces with standard D-SUB connectors. There are two interface cables delivered with the OSCI to connect the on board headers with the standard 9 pin D-SUB connectors.

4.4.1 CONFIGURATION OF THE CABLES

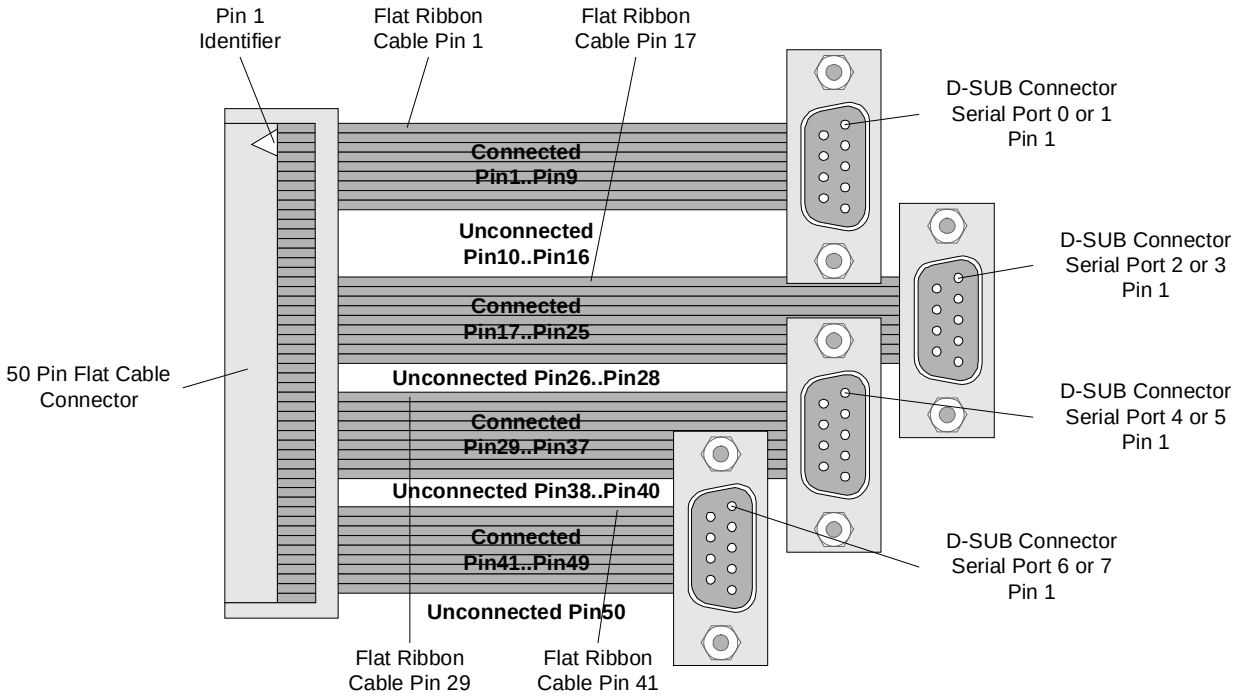


Figure 8: Flat Cable With Header Connector And 9 Pin D-SUB Connectors

4.4.2 SERIAL INTERFACE D-SUB CONNECTORS

Pin Number	Signal RS232	Description RS232	Signal RS485/422	Description RS485/422	Pin Out
1	DCD	Data Carrier Detect	NC	Not Connected	
2	RxD	Receive Data	Rx+	Receive Data +	
3	TxD	Transmit Data	Tx+	Transmit Data +	
4	DTR	Data Terminal Ready	NC	Not Connected	
5	GND	Ground	GND	Ground	
6	DSR	Data Set Ready	NC	Not Connected	
7	RTS	Request To Send	Rx-	Receive Data -	
8	CTS	Clear To Send	Tx-	Transmit Data -	
9	RI	Ring Indicator	NC	Not Connected	

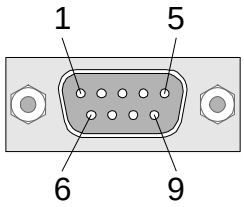


Figure 9: Serial Interface Connector

Table 5: Serial Interface D-SUB Connector Pin Out

Note:

- All interface signals are ESD protected on the OSCI.
- **In case of RS485 half duplex mode the signals Rx+ / Tx+ and Rx- / Tx- must be connected together in the cable connector case.**

© 2004 by MPL AG, Switzerland

5. CONFIGURATION

5.1 PC/104-PLUS MODULE SLOT SELECTION

Figure 10: Module Slot Selection Slide Switch S1

S1_1	S1_2	PC/104-*Plus* Module Slot
OFF	OFF	0
OFF	ON	1
ON	OFF	2
ON	ON	3

Table 6: DIP-Switch S1 Settings

The OSCI needs no PCI REQ/GNT pair. It can used in a standard PC/104-*Plus* stack at any position.
In the MPL's PIPx family only PC/104-*Plus* Slot 0 and Slot 1 are supported.

5.2 RS485 / RS232 INTERFACE SELECTION

The selection of the interface type is made via the hardware driver, either with IoCtrls or at Boot Time.

5.2.1 LINUX

Please refer to the chapter 7.1.2 for further information.

5.2.2 VxWORKS

Please refer to the chapter 7.2 for further information.

5.2.3 WINDOWS

In the Windows operating systems you can easy select the function you want in the System Control panel under OSCI Configuration. Please refer to the chapter 7.3.2 for further information.

5.3 CABLE CONFIGURATION IN RS485 / RS422 MODE

5.3.1 HALF AND FULL DUPLEX

For half duplex mode it's needed that you connect in your cable connector the Tx+ / Rx+ signals and the Rx- / Tx- signals together. So you have a 2 wire cable.
In full duplex mode you have a 4 wire cable and you must not connect any signals together.

NOTE:

In half duplex mode connect the Tx+ / Rx+ signals and the Rx- / Tx- signals together.

5.3.2 TERMINATION

If the OSCI is at the end of your half duplex network you have to terminate in the cable connector the differential transceiver lines Rx+/Tx+ to Rx-/Tx- with 120Ω.
For full duplex mode you must have a cable with 4 wires. If the OSCI is at the end of your 4 wire serial network you have to terminate the Rx+ /Rx- signals with either 100Ω or 120Ω.

NOTE:

If the OSCI is at the end of your serial network terminate the Receiver input with 100Ω or 120Ω

© 2004 by MPL AG, Switzerland

6. OPERATION

6.1 RS232 BASICS

The full name of this interface is “Interface Between Data Terminal Equipment [DTE, e.g. PC] and Data Circuit-Terminating Equipment [DCE, e.g. modem] Employing Serial Binary Data Interchange”.
The maximum driver load capacitance is specified as 2500pF. This allows a cable length of about 15m..20m, dependent on the cable quality. The RS232 interface don’t need any termination resistors at any end of the transmission line.
The signal levels allowed on driver output are:

High level or 1 or Mark:	-5V..-15V
Low level or 0 or Space:	5V..15V

The signal levels allowed on receiver input are:

High level or 1 or Mark:	-3V..-25V
Low level or 0 or Space:	3V..25V

The driver interface devices used on OSCI have a maximum withstand rating for receiver and transmitter pins of +/- 30V.

6.2 RS422 / RS485 BASICS

6.2.1 TOPOLOGIES ACCORDING TO RS422 AND RS485

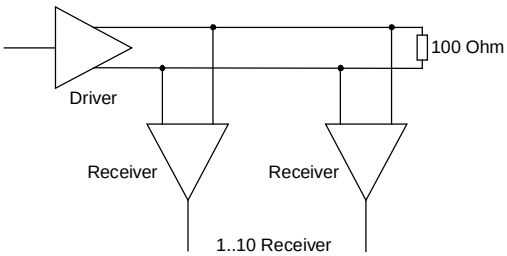


Figure 11: RS422 Topology, Simplex Operation

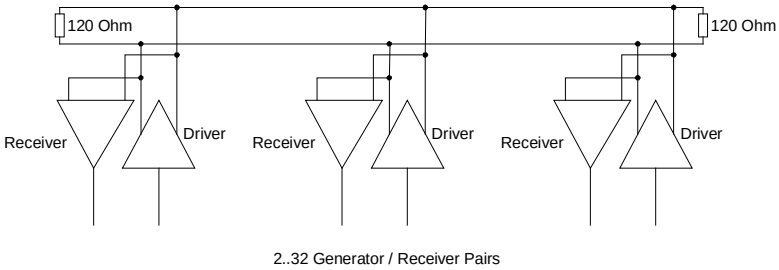


Figure 12: RS485 Topology, Half Duplex Operation

2 Simplex lines in opposite direction (each with one receiver) result in a full duplex line.

6.2.2 SOME IMPORTANT VALUES

	RS422	RS485	OSCI Differences
Max. Common Mode Voltage	-7V..+7V	-7V..+12V	+/-30V
Receiver Input Impedance	Min. 4kΩ	Min. 12kΩ	5kΩ
Minimum Generator Load	100Ω	60Ω	
Generator Short Circuit Current	<150mA to GND	<250mA to –7V..+12V	
Signal High Level (Rx+ - Rx-)	> 200mV		
Signal Low Level (Rx+ - Rx-)	< -200mV		
Number Of Receivers	1..10	1..32	1..30
Max. Cable Length	About 1200m (also see below)		
Termination Resistor	100Ω	120Ω	

The OSCI hardware supports the stronger requirements of the RS485 standard. Except for the receiver input impedance. That reduces the maximum number of receivers that can be connected to one driver. The maximum allowed load with RS485 receivers (without the termination) is 375Ω (12kΩ 32 times in parallel) for a driver. So if all other receivers are in the RS485 specification you can only connect 30 receivers to a driver and not 32.
A rule of thumb says the product of data rate in Bits/s and the line length in meter must be <= 10^8 (means e.g. 1Mbit/s with 100m or 100kbit/s with 1000m), but this is depending on the cable quality. Also it is not true for cables longer than about 1000m.
The longer the line the greater the possibility of high common mode voltages. In some arrangements it is better to use an interface with galvanic isolation for long connection lines.

© 2004 by MPL AG, Switzerland

7. DRIVERS

The OSCI needs a special driver from MPL AG.

7.1 LINUX

There is an OSCI Linux driver for the old driver model and also one for the new driver model in kernel 2.6 available. With the old driver model only RS232 interfaces are supported until now.

7.1.1 DRIVER INSTALLATION

All the Files you need, you will find on the MPL AG's homepage **www.mpl.ch**.
The MPL OSCI driver is provided as a patch against the official Linux-2.6.x kernel source, so in order to use the driver you have to compile and install a new kernel and modules on your Linux machine.
The following is a quick step guide for this task:

- Download and/or install Linux-2.6.x kernel source on your machine
- Download the file "mpl_osci.patch.bz2" to machine
- Patch the kernel using "bunzip2 -c mpl_osci.patch.bz2 | patch -Ep1"
- Configure the kernel with support for MPL OSCI
- After a successful "make bzImage modules", install the new kernel and modules
- Reboot to use the new kernel or load the module using "modprobe mpl_osci"

7.1.2 DRIVER CONFIGURATION

(Almost) all driver configuration is done using IOCTLs. Some of them are OSCI specific (for more info, see chapter 7.1.3), others are common for a whole class of devices.

7.1.3 DRIVER IOCTRLS

There are a number of OSCI specific IOCTLs. Please take a look at the "oscimode.c" file to get an idea on how to use them.
Please note that the interface of the OSCI specific IOCTL calls is not stable yet.

7.2 VXWORKS

A VxWorks driver is in the queue.

7.3 WINDOWS

There are OSCI drivers for WinNT4.0, Win2000 and WinXP available. A WinCE driver is in the queue.

NOTE:

The WinNT4.0 driver supports only 1 OSCI card!

The Win2000 and WinXP driver supports power management and disables the transceiver chips if the ports are not opened with software.

7.3.1 DRIVER INSTALLATION

All the drivers and install programs you will find on the MPL AG's homepage **www.mpl.ch**.

7.3.1.1 WINDOWS NT

To install the driver and a set-up tool, you only have to execute the driver install program osciNTxx.exe (xx stays for the version number).
Then the system ask for a reboot. Click Yes and after the Reboot the OSCI can be configured with the OSCI Configuration Control Panel Applet. For more information about OSCI configuration please refer to the chapter 7.3.2.

NOTE:

It's important that you configure each ports interface type, else the ports stay in disable mode and nothing can be transmitted!

© 2004 by MPL AG, Switzerland

7.3.1.2 WINDOWS 2000

- Install the OSCI hardware in your system (please refer to chapter 8 for more information).
- At the next boot time Windows 2000 will find a new PCI Serial Port Device.

- Then the Found New Hardware Wizard will start and prompt you trough all the needed steps.

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
This wizard helps you install a device driver for a hardware device.
To continue, click Next.
< Back
Next >
Cancel

- But first unzip the osci2kxx.zip file to the C:\TEMP directory or elsewhere on your system.
- Click next and select “Search for a suitable driver ...”.

Found New Hardware Wizard
Install Hardware Device Drivers
A device driver is a software program that enables a hardware device to work with an operating system.
This wizard will complete the installation for this device:
PCI Serial Port
A device driver is a software program that makes a hardware device work. Windows needs driver files for your new device. To locate driver files and complete the installation click Next.
What do you want the wizard to do?
Search for a suitable driver for my device (recommended)
Display a list of the known drivers for this device so that I can choose a specific driver
< Back
Next >
Cancel

© 2004 by MPL AG, Switzerland

- Click next and select “Specify a location”.

Found New Hardware Wizard
Locate Driver Files
Where do you want Windows to search for driver files?
Search for driver files for the following hardware device:
PCI Serial Port
The wizard searches for suitable drivers in its driver database on your computer and in any of the following optional search locations that you specify.
To start the search, click Next. If you are searching on a floppy disk or CD-ROM drive, insert the floppy disk or CD before clicking Next.
Optional search locations:
Floppy disk drives
CD-ROM drives
Specify a location
Microsoft Windows Update
< Back
Next >
Cancel

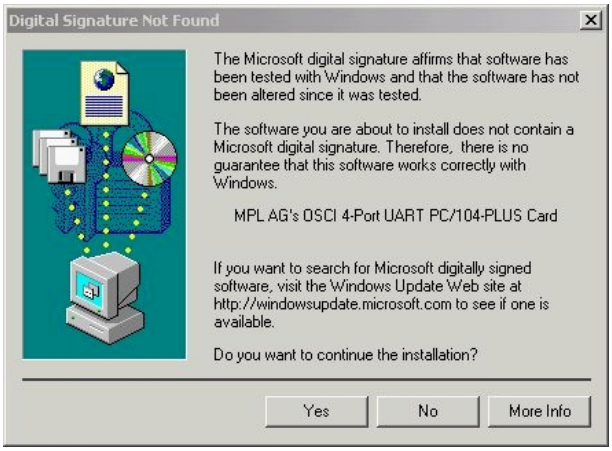
- Select the directory you have unzipped the driver files to, then click OK.

- Then the results will appear. Click Next.

Found New Hardware Wizard
Driver Files Search Results
The wizard has finished searching for driver files for your hardware device.
The wizard found a driver for the following device:
PCI Serial Port
Windows found a driver for this device. To install the driver Windows found, click Next.
c:\temp\serosci.inf
< Back
Next >
Cancel

© 2004 by MPL AG, Switzerland

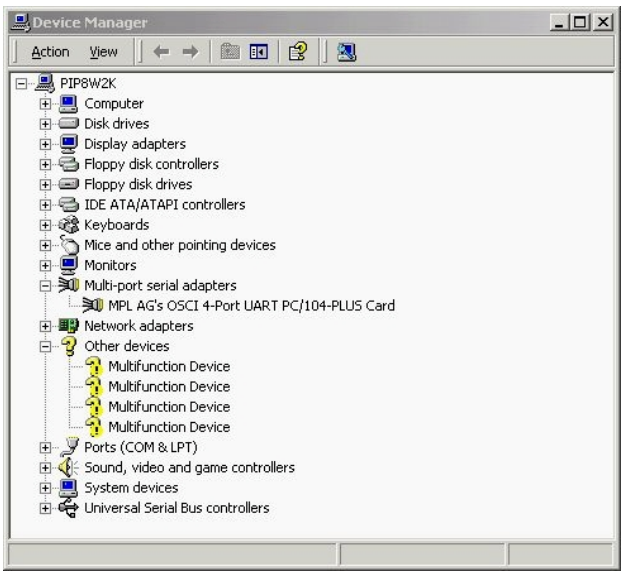
- Windows ask you if you want to install the driver even though it is not signed. Click Yes.


Digital Signature Not Found
The Microsoft digital signature affirms that software has been tested with Windows and that the software has not been altered since it was tested.
The software you are about to install does not contain a Microsoft digital signature. Therefore, there is no guarantee that this software works correctly with Windows.
MPL AG's OSCI 4-Port UART PC/104-PLUS Card
If you want to search for Microsoft digitally signed software, visit the Windows Update Web site at http://windowsupdate.microsoft.com to see if one is available.
Do you want to continue the installation?
Yes
No
More Info

- Windows informs you that the installation has finished. Click Finish.

Found New Hardware Wizard
Completing the Found New Hardware Wizard
MPL AG's OSCI 4-Port UART PC/104-PLUS Card
Windows has finished installing the software for this device.
The hardware you installed will not work until you restart your computer.
To close this wizard, click Finish.
< Back
Finish
Cancel

- Then in the Device Manager a new device will appear. An MPL AG's OSCI x-Port UART PCI Card with x (4 or 8) Multifunction Devices.

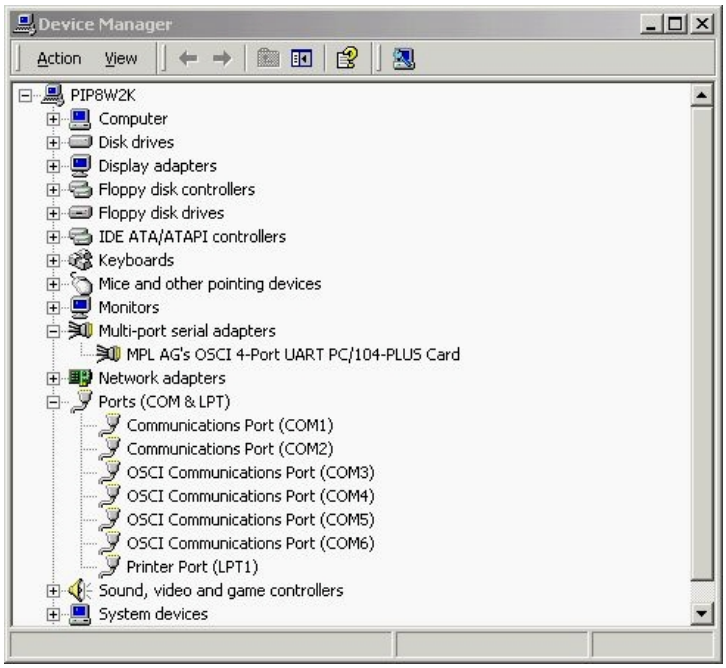


© 2004 by MPL AG, Switzerland

- Then Windows will find a new Multifunction Device and you have to do the same procedure like for the PCI Serial Port Device.

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
This wizard helps you install a device driver for a hardware device.
To continue, click Next.
< Back
Next >
Cancel

- After the first Multifunction Device is proper installed the next Multifunction Devices will be installed automatically. At the end of the procedure x (4 or 8) new OSCI Communications Port Devices will appear in the Device Manager.



- Don't forget to configure all the new OSCI Communication Ports with the also installed OSCI Configuration Tool in the Control Panel. For more information please refer to the chapter 7.3.2.

© 2004 by MPL AG, Switzerland

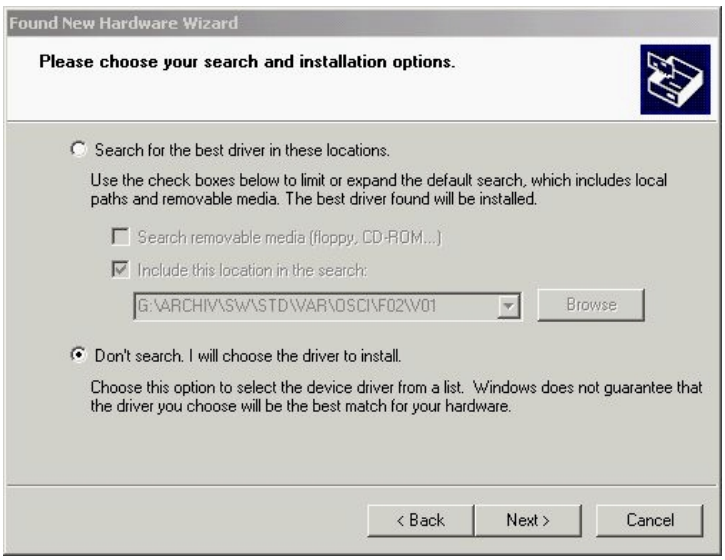
7.3.1.3 WINDOWS XP

Windows XP searches a very long time for all the new hardware devices. As long as the symbol
is displayed in the right lower corner the installation is not finished and every manual change in the Device Manager can damage the installation process. The following instructions guide you through the installation process:

- Install the OSCI hardware in your system (please refer to chapter 8 for more information).
- At the next boot time Windows XP will find a new PCI Serial Port Device. Attend that Windows XP needs a long time until the Hardware Wizard will appear. Select “Install from a list ...” then the installation process goes faster. Click Next.

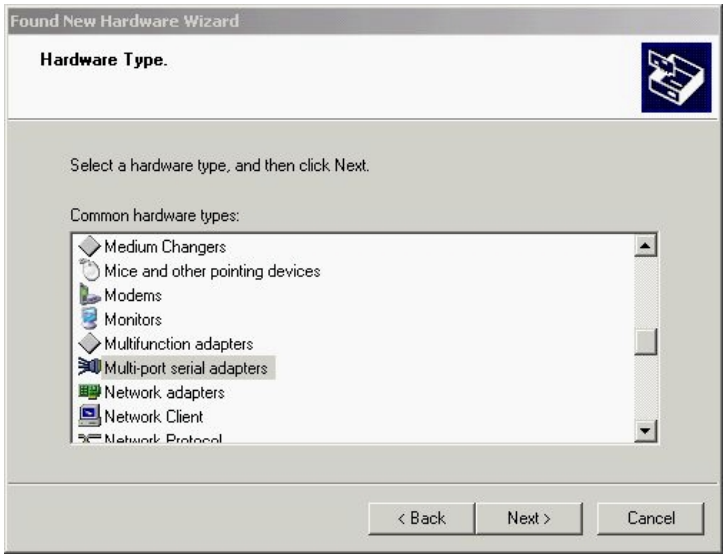
Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
This wizard helps you install software for:
PCI Serial Port
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

- But first unzip the osciXPxx.zip file to the C:\TEMP directory or elsewhere on your system.
- Select “Don’t search. I will choose ...”. Click Next.

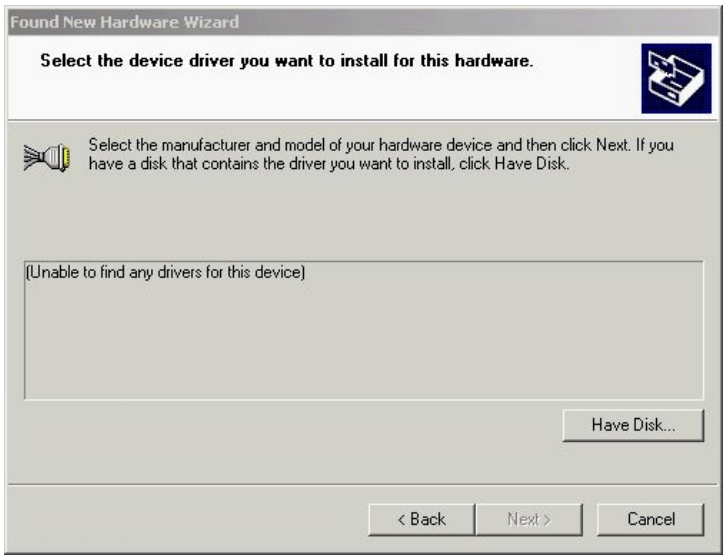

Found New Hardware Wizard
Please choose your search and installation options.
Search for the best driver in these locations.
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
Search removable media (floppy, CD-ROM...)
Include this location in the search:
G:\ARCHIV\SW\STD\VAR\OSCI\F02\V01
Browse
Don't search. I will choose the driver to install.
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.
< Back
Next >
Cancel

© 2004 by MPL AG, Switzerland

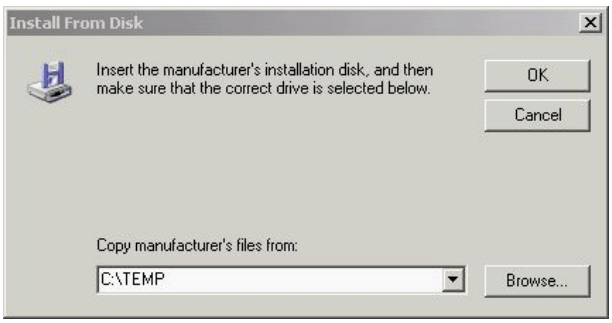
- Select “Multi-port serial adapters”. Click Next.



- Select “Have Disk ...”.

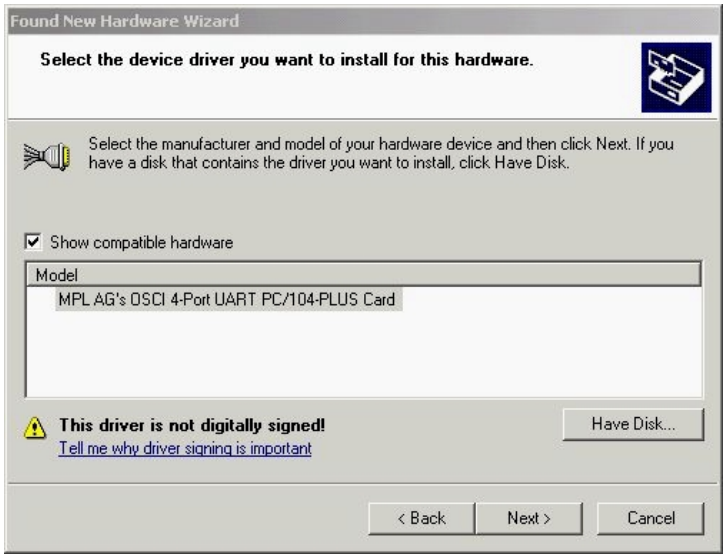

Found New Hardware Wizard
Select the device driver you want to install for this hardware.
Select the manufacturer and model of your hardware device and then click Next. If you have a disk that contains the driver you want to install, click Have Disk.
(Unable to find any drivers for this device)
Have Disk...
< Back
Next >
Cancel

- Select the directory you have unzipped the driver files to, then click OK.

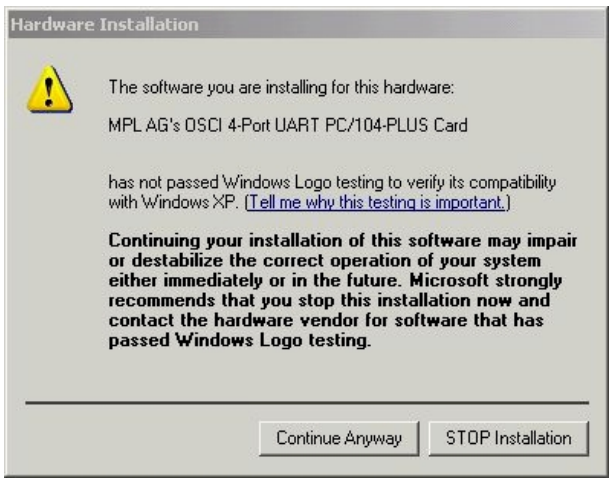


© 2004 by MPL AG, Switzerland

- Windows will find an appropriate model for the OSCI hardware. Select the needed model and click Next.


Found New Hardware Wizard
Select the device driver you want to install for this hardware.
Select the manufacturer and model of your hardware device and then click Next. If you have a disk that contains the driver you want to install, click Have Disk.
Show compatible hardware
Model
MPL AG's OSCI 4-Port UART PC/104-PLUS Card
This driver is not digitally signed!
Tell me why driver signing is important
Have Disk...
< Back
Next >
Cancel

- Windows asks you about the Windows Logo Test. Click “Continue Anyway”.

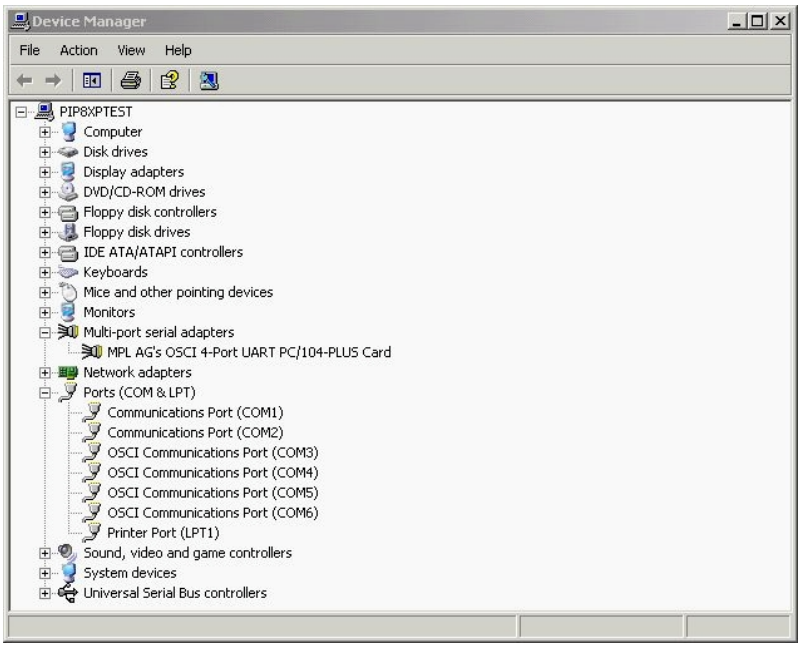

Hardware Installation
The software you are installing for this hardware:
MPL AG's OSCI 4-Port UART PC/104-PLUS Card
has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation

- Windows informs you that the installation has finished. Click Finish.

Found New Hardware Wizard
Completing the Found New Hardware Wizard
The wizard has finished installing the software for:
MPL AG's OSCI 4-Port UART PC/104-PLUS Card
Click Finish to close the wizard.
< Back
Finish
Cancel

© 2004 by MPL AG, Switzerland

- Then Windows will find 4 or 8 new Multifunction Devices and you have to do for each Multifunction Device the same procedure like for the PCI Serial Port Device.
- If you do that correctly the Device Manager will display an “MPL AG’s OSCI x-Port UART PC/104-PLUS Card” and x “OSCI Communications Port” devices. Dependent on the variant of your OSCI card x is 4 or 8:



- Don’t forget to configure all the new OSCI Communication Ports with the also installed OSCI Configuration Tool in the Control Panel. For more information please refer to the chapter 7.3.2.

© 2004 by MPL AG, Switzerland

7.3.2 DRIVER CONFIGURATION

For the Windows driver settings there is a Control Panel Applet that you let configure the driver graphically. For each OSCI serial port there is a page to set all the needed information.

NOTE:

It is important that you go through all the pages in the Control Panel Applet and configures all the interface types you want. Else all OSCI serial ports will stay disabled in hardware.

For more information about the several buttons and list boxes there is a help included in the OSCI Control Panel Applet.

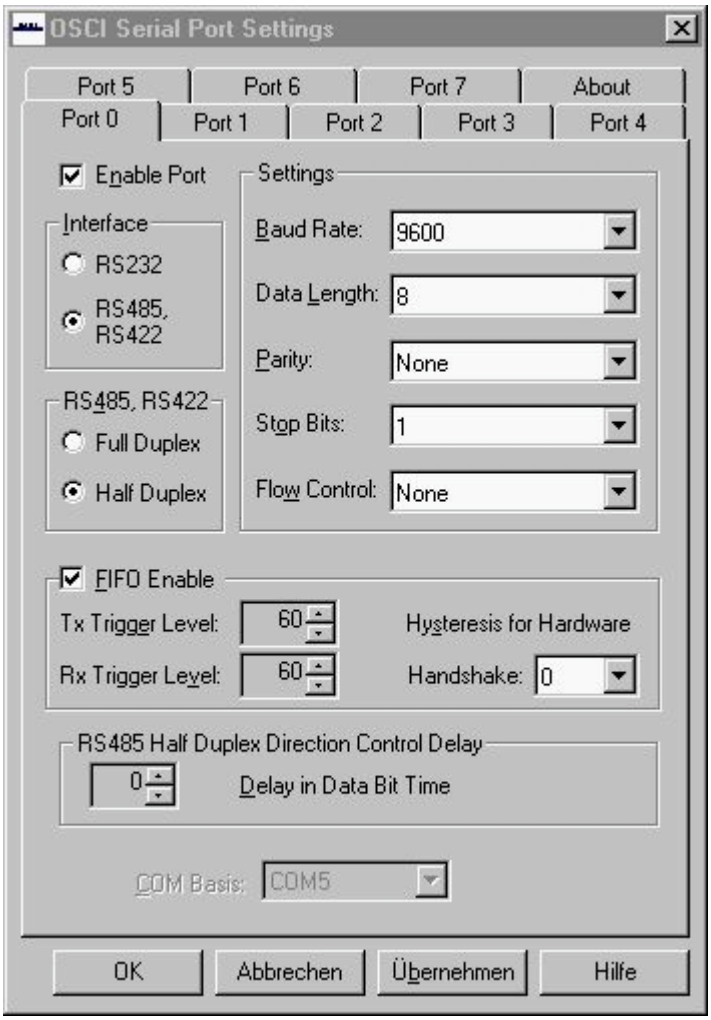


Figure 13: Control Panel Applet To Configure The OSCI Hardware

Don't use the Windows specific Ports tool (in Windows NT only) out of the Control Panel for configuring the OSCI hardware. It doesn't support all the OSCI serial port features.
Attend that Terminal programs or other applications can change (with IoCtrls) standard settings like baud rate, parity, flow control .. you have made with the OSCI Configuration Tool.

NOTE:

The OSCI ports COM numbering and the numbering in the Configuration Panel is in WinXP and Win2000 systems from behind to ahead. Port 0 (first OSCI COM port in the Windows system) is in WinXP and Win2000 systems the last hardware port.

© 2004 by MPL AG, Switzerland

7.3.3 DRIVER IOCTRLS

7.3.3.1 IOCTRL DEFINITION

The windows drivers support all IoCtrls the standard Microsoft serial driver also supports. But there are also some MPL AG specific IoCtrls you will find in the osciAPI.h file on the MPL AG homepage **www.mpl.ch**. The File is also printed below. But for the latest version always have a look at the homepage.
With this special IoCtrls you can select which interface type you want, if RS232 or RS485/RS422 with full or half duplex, and the RS485 auto direction control delay.

```
/*++

Module Name:
    osciAPI.h             Copyright (c) 2004 MPL AG

Abstract:
    This is the include file that defines all constants and types specific to the
    serOSCI.sys driver from MPL AG. It can be used to make serOSCI driver specific
    ioctrls from an application program.

    All microsoft standard serial driver specific ioctrls are also included in the
    serOSCI.sys driver and can be used by the application program.

Author:
    Patrik Hossle (ph) 2004-03-18

Revision History:
    2004-03-18            first edition

--*/

#ifndef _osciAPI_H_
#define _osciAPI_H_

//
// struct for IOCTL_OSCI_MPIO_READ_PLD / IOCTL_OSCI_MPIO_WRITE_PLD ioctrls
//
typedef struct _INTERFACE_MODE {
    UCHAR RS232Enable;            // FALSE: rs232 disabled, TRUE: rs232 enabled
    UCHAR RS485Enable;            // FALSE: rs485 disabled, TRUE: rs485 enabled
    // -> in hardware the enable for rs232 is stronger than the enable for rs485
    UCHAR FDEnable;               // FALSE: half duplex enable, TRUE: full duplex enable
} INTERFACE_MODE,*PINTERFACE_MODE;

//
// struct for IOCTL_OSCI_SET_RS485_DELAY / IOCTL_OSCI_GET_DELAY_DELAY ioctrls
//
typedef struct _RS485_DELAY {
    UCHAR RS485Delay;   // delay in transmitter bit time. valid is 0 .. 15
                        // in auto rs485 half duplex mode the driver is disabled after
                        // this number in bit times (e.g. 9600 baud: bit time = 104.2 us)
} RS485_DELAY,*PRS485_DELAY;

//
// Define the various device type values.  Note that values used by Microsoft
// Corporation are in the range 0-32767, and 32768-65535 are reserved for use
// by customers.
//
#define FILE_DEVICE_OSCI  0x00008005

//
// Macro definition for defining IOCTL and FSCTL function control codes. Note
// that function codes 0-2047 are reserved for Microsoft Corporation, and
// 2048-4095 are reserved for customers.
//
```

```
#define OSCI_IOCTL_INDEX  0x805

// mpl ioctrls for handling the interface type
#define IOCTL_OSCI_MPIO_READ_PLD        CTL_CODE(FILE_DEVICE_OSCI, OSCI_IOCTL_INDEX+0x20,
    METHOD_BUFFERED, FILE_ANY_ACCESS)
#define IOCTL_OSCI_MPIO_WRITE_PLD       CTL_CODE(FILE_DEVICE_OSCI, OSCI_IOCTL_INDEX+0x21,
    METHOD_BUFFERED, FILE_ANY_ACCESS)
#define IOCTL_OSCI_SET_RS485_DELAY      CTL_CODE(FILE_DEVICE_OSCI, OSCI_IOCTL_INDEX+0x22,
    METHOD_BUFFERED, FILE_ANY_ACCESS)
#define IOCTL_OSCI_GET_RS485_DELAY      CTL_CODE(FILE_DEVICE_OSCI, OSCI_IOCTL_INDEX+0x23,
    METHOD_BUFFERED, FILE_ANY_ACCESS)

#endif  //_osciAPI_H_
```

7.3.3.2 IOCTRL EXAMPLE

Set COM10 to RS485 (with half duplex mode) and the RS485 auto direction control delay to 10 bit times.

```
#include “osciAPI.h”
...
... function(...){
   unsigned long    CountReturned;
   INTERFACE_MODE   InterfaceMode;
   RS485_DELAY      RS485Delay;
...
   hdriver = CreateFile(“\\\\.\\COM10”,
                        GENERIC_READ | GENERIC_WRITE,
                        0,
                        NULL,
                        OPEN_EXISTING,
                        0,
                        NULL);
   InterfaceMode.RS232Enable = FALSE;
   InterfaceMode.RS485Enable = TRUE;
   InterfaceMode.FDEnable = FALSE;
   DeviceIoControl(hdriver,
                   IOCTL_OSCI_MPIO_WRITE_PLD,
                   &InterfaceMode,
                   sizeof(INTERFACE_MODE),
                   NULL,
                   0,
                   (LPDWORD)&CountReturned,
                   0);
   RS485Delay.RS485Delay = 10;
   DeviceIoControl(hdriver,
                   IOCTL_OSCI_SET_RS485_DELAY,
                   &RS485Delay,
                   sizeof(RS485_DELAY),
                   NULL,
                   0,
                   (LPDWORD)&CountReturned,
                   0);
   CloseHandle(hdriver);
...
}
```

7.4 TESTED OPERATING-SYSTEMS

The following combinations of operating systems and MPL single board computers with OSCIs are tested in the lab:

PIP405:	TBD
PIP5:	NT4.0
PIP6:	NT4.0
PIP7:	Linux with Kernel 2.6
PIP8:	Windows 2000, Windows XP SP1

© 2004 by MPL AG, Switzerland

8. MOUNTING

The OSCI shall only be mounted by qualified personnel. MPL AG accepts no responsibility for any damage to the host system or the OSCI module caused by the mounting procedure.

NOTE:

Before starting, verify that the host system is switched off and disconnected from the main power. Review and observe the safety precautions description at the beginning of this manual to avoid personal injury or damage to equipment.

8.1 PARTS NEEDED FOR MOUNTING

- OSCI module
- 4 M3 x 6mm screws

8.2 MOUNTING DESCRIPTION

1. Turn the power on your host system off.
2. Plug the OSCI module to its place and **insure that no pin is bent!**
3. Insert and secure the screws at the mounting holes.

8.3 MECHANICAL DIMENSIONS

The location of the PC/104-*Plus* connectors and mounting holes you can find in the PC/104-*Plus* Specification on the homepage of the PC/104 Consortium:

http://www.pc104.org/

The following picture is true for all OSCI variants. There are only little changes in the assembly between the several variants.

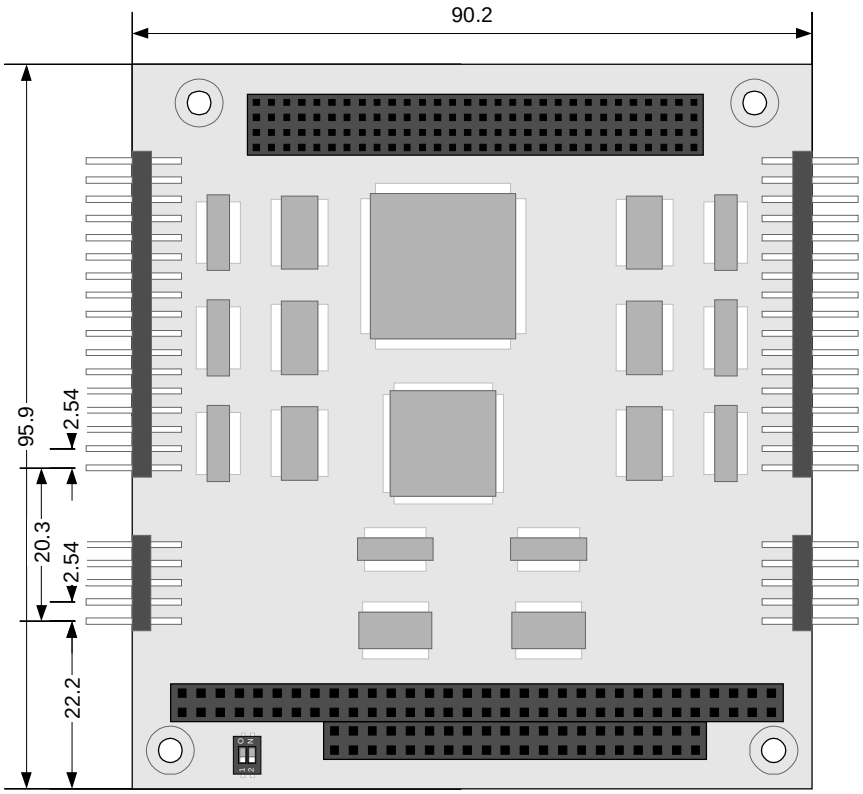


Figure 14: OSCI Top View

© 2004 by MPL AG, Switzerland

THIS PAGE IS INTENTIONALLY LEFT BLANK!

© 2004 by MPL AG, Switzerland

THIS PAGE IS INTENTIONALLY LEFT BLANK!

© 2004 by MPL AG, Switzerland

9. COPYRIGHT

Copyright © 2004 by MPL AG Elektronikunternehmen. All rights are reserved. Reproduction of this document in part or whole, by any means is prohibited, without written permission from MPL AG Elektronikunternehmen.

10. DISCLAIMER

MPL AG has fully tested the OSCI module and reviewed the documentation. However, MPL AG makes no warranty or representation, either expressed, or implied, with respect to this product, its quality, performance, merchantability, or fitness for a particular purpose.

In no event will MPL AG be liable for direct, indirect, special, incidental, or consequential damages resulting from any defect in the product or its documentation, even if advised of the possibility of such damages. In particular MPL AG shall have no liability for any parts connected to this product.

MPL AG reserves the right to make changes to any product herein to improve reliability, function or design.

11. SUPPORT

In case of questions please feel free to contact us at our homepage (**www.mpl.ch**) or per email (**support@mpl.ch**).

Our local Distributor: